

"Express Mail" mailing label number:

EV324253135US

**SYSTEM AND METHOD FOR REMOTELY BUILDING AN INFORMATION  
HANDLING SYSTEM MANUFACTURING IMAGE**

Tim W. Cox

Edward Batchelor

5 Andrew L. Harris

Marc Jarvis

Chandar Kamalanathan

**BACKGROUND OF THE INVENTION**

10 **Field of the Invention**

The present invention relates in general to the field of information handling system manufacture, and more particularly to a system and method for remotely building an information handling system manufacturing image.

**Description of the Related Art**

15 As the value and use of information continues to increase, individuals and businesses seek additional ways to process and store information. One option available to users is information handling systems. An information handling system generally processes, compiles, stores, and/or communicates information or data for business, personal, or other purposes thereby allowing users to take advantage of the  
20 value of the information. Because technology and information handling needs and requirements vary between different users or applications, information handling systems may also vary regarding what information is handled, how the information is handled, how much information is processed, stored, or communicated, and how quickly and efficiently the information may be processed, stored, or communicated.  
25 The variations in information handling systems allow for information handling systems to be general or configured for a specific user or specific use such as financial transaction processing, airline reservations, enterprise data storage, or global communications. In addition, information handling systems may include a variety of

hardware and software components that may be configured to process, store, and communicate information and may include one or more computer systems, data storage systems, and networking systems.

Information handling system users have tremendous flexibility in the hardware  
5 and software configurations that they employ to perform various functions. For instance, components having different processing rates, networking modes and storage capacity are often selected to build information handling systems for performing specific functions. In addition, a variety of software applications are configured upon completion of manufacture of information handling systems so that a  
10 shipped system arrives ready to perform the intended function. However, one difficulty with the wide variety of available hardware and software configurations is that information handling system users that deploy numerous systems over a period of time often have difficulty maintaining the compatibility of the systems with each other. For this reason, large employers who purchase information handling systems in  
15 bulk, such as corporate or government entities, tend to prepare hard disc drive images in advance of the manufacture of ordered systems so that the manufacturer loads the image prior to shipment of the systems. Typically, an information technology administrator of the purchaser configures an exemplary system with a desired software configuration and then sends the hard disc drive or an image of the hard disc  
20 drive to the manufacturer. Physical copying and shipment of media containing a desired image is time consuming and susceptible to delivery and media failures. The manufacturer then assembles systems having hardware components that are compatible with the image and copies the image to each hard disc drive.

One difficulty with the ordering and building of custom images is that  
25 information handling system configuration and hard disc drive imaging are complex and time-consuming so that custom image ordering is, for practicable purposes, restricted to sophisticated purchasers. However, even sophisticated purchasers might inadvertently introduce configuration errors or even malicious programs that disrupt the manufacturing cycle. Thus, information handling system manufacturers generally  
30 must test custom images for potential errors, usually with each hardware configuration variation. Building and testing systems with custom images is generally a labor-intensive task that increases manufacturing expense and decreases

manufacturing efficiency. Some applications aid in the creation and testing of custom images, such as VMWare, by creating a “virtual” information handling system in memory and providing an interface to test the operation of the virtual system.

Generally, creation and testing of virtual information handling systems exceeds the  
5 expertise of typical information technology administrators who often defer the configuration and testing of ordered systems to the manufacturer.

### **SUMMARY OF THE INVENTION**

Therefore a need has arisen for a system and method which supports remote building of images for use in manufacture of information handling systems.

10 In accordance with the present invention, a system and method are provided which substantially reduce the disadvantages and problems associated with previous methods and systems for building images for support of information handling system manufacture. A customer remotely accesses an information handling system manufacturer image builder through network communications, such as the Internet, to  
15 build an image at the manufacturer for use in manufacture of information handling systems for the customer.

More specifically, an image builder server accessible by the customer through the Internet builds images for manufacture of information handling systems with an image library and test information handling systems. The image library includes  
20 manufacture defined image components, such as operating systems, base images, and applications, and also includes builder defined image components associated with the customer, such as files, custom applications, custom settings and previously-ordered images. An image creation engine associated with the image builder server accepts image parameters input remotely by a customer and installs the components  
25 associated with the parameters on test information handling systems. The test information handling systems include actual hardware systems having compatible hardware configurations and virtual systems generated in memory to simulate an actual hardware system. The image creation engine builds an image on the test systems and copies the built image to save to the library for subsequent use in

manufacture of information handling systems or generation of variations of the image. The image builder server also supports remote editing of existing images, testing of images installed on test systems, promotion of images for use in manufacture and management by a customer of that customer's builder defined image components.

- 5           The present invention provides a number of important technical advantages. One example of an important technical advantage is that remote building of an image at a manufacturer site reduces the time and complexity of creating an image. For instance, images are created locally and stored at the manufacture site to preclude the need for customers to copy and ship media with the image to the manufacturer.
- 10       Quality control for manufacture of systems is improved with selection of components for the image limited to a library controlled by the manufacturer, thus reducing the risk of improperly configured images or the introduction of malicious programs. The ready availability of virtual information handling systems to build and test images reduces delays in building and promoting images, such as through the use of manual
- 15       labor to prepare comparable hardware systems, and is essentially invisible to customers.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

- The present invention may be better understood, and its numerous objects, features and advantages made apparent to those skilled in the art by referencing the accompanying drawings. The use of the same reference number throughout the
- 20       several figures designates a like or similar element.

          Figure 1 depicts a block diagram of a system for remote building of an information handling system image; and

- Figure 2 depicts a flow diagram of a process for remote building of an
- 25       information handling system image.

#### **DETAILED DESCRIPTION**

          Remote building of an information handling system image by a customer at a manufacturer through networked communication reduces the complexity of testing

and manufacture of customized information handling systems. For purposes of this disclosure, an information handling system may include any instrumentality or aggregate of instrumentalities operable to compute, classify, process, transmit, receive, retrieve, originate, switch, store, display, manifest, detect, record, reproduce, handle, or utilize any form of information, intelligence, or data for business, scientific, control, or other purposes. For example, an information handling system may be a personal computer, a network storage device, or any other suitable device and may vary in size, shape, performance, functionality, and price. The information handling system may include random access memory (RAM), one or more processing resources such as a central processing unit (CPU) or hardware or software control logic, ROM, and/or other types of nonvolatile memory. Additional components of the information handling system may include one or more disk drives, one or more network ports for communicating with external devices as well as various input and output (I/O) devices, such as a keyboard, a mouse, and a video display. The information handling system may also include one or more buses operable to transmit communications between the various hardware components.

Referring now to Figure 1, a block diagram depicts a system for remote building by a customer of an image for use in manufactured information handling systems 10. The customer remotely accesses the manufacturer location through networked communications 12, such as the Internet or an intranet, with an image builder user interface 14. Customer interaction with the manufacturer location is managed through an image builder server 16 having a network interface 18, such as a security subsystem and firewall to restrict unauthorized access. Image builder server 16 presents user interface information formatted for use by a web browser, such as HTML pages.

Image builder server 16 includes a number of functional modules that interact with image build and test information handling systems 30 and an image library 36 within the manufacturer location to create images for use in manufacture of information handling systems 10. An image creation engine 20 accepts image parameters remotely input from the customer with image builder user interface 14 and applies the parameters to image library 36 to assemble image components associated with the parameters to an image build and test information handling system 30. For

example, image creation engine allows selection through image builder user interface 14 of manufacturer defined image components 38 or builder defined image components 40. Manufacturer defined image components 38 include operating systems, base images and applications. The manufacturer defined base images  
5 provide a building block approach with a variety of base images having different combinations of commonly selected operating systems and applications for use with commonly used hardware components. Builder defined image components 40 include files, applications, custom settings and images defined for a particular customer, such as images previously developed by the customer. Custom settings for  
10 a particular customer include but are not limited to hard disc drive partition definitions, BIOS settings, network settings, desktop settings, system names, and registry entries.

Once a customer remotely defines image parameters, an image manifest is locally created and stored so that the image can be recreated upon demand. Image  
15 creation engine 20 uses the image manifest to select associated components from image library 36 for installation on image build and test information handling systems 30. For example, the selected components are installed on a virtual system 32 created in memory or an actual hardware-compatible information handling system 34 interfaced with the image builder server. Image creation engine 20 formats and  
20 partitions the hard disc drive, whether hardware or virtual, loads a multi-platform capable base image that includes all appropriate HALs, drivers and an operating system, configures the operating system, loads and configures selected applications, applies network, desktop, user policy, BIOS and other settings and then makes the image available to the user for test. Once build and test information handling system  
25 30's installation and configuration is complete, image creation engine 20 copies the image of the hard disc drive of build and test system 30 to image library 36 as a builder defined image component 40 available for subsequent use in manufacture of an information handling system 10.

Image builder server 16 includes an image edit engine that supports editing of  
30 base images to adapt to desired changes input through image builder user interface 14. For instance, a customer may build a new image for use in manufacture by editing a manufacturer base image or previously built customer image stored in image library,

such as is disclosed by U.S. Patent Application Serial No. 10/317,871, entitled  
“Platform Independent Imaging Method and System” filed on December 12, 2002 and  
incorporated herein by reference. An image test engine 24 incorporated in image  
builder server 16 interfaces with virtual systems 32 and hardware systems 34 to allow  
5 remote test commands of information handling systems having a selected image  
loaded. An image promotion engine 26 allows a customer to promote a selected  
image to an information handling system factory manufacturing environment 42 to  
manufacture information handling systems 10 with the image. An image management  
engine 28 allows a customer to manage the builder defined image components 40  
10 within image library 36, such as allowing uploading of customer-specific files,  
applications and settings for inclusion in images and saving or deleting previously  
created images.

Referring now to Figure 2, a flow diagram depicts a process for remote  
building of an information handling system image. The process begins at step 44 with  
15 the remote selection of a base image having the desired platform characteristics,  
drivers, operating system and HAL. At step 46, the manufacturer components are  
selected for inclusion in the image, and at step 48, the custom components are  
selected for inclusion in the image. Once all of the base image, manufacturer  
components and custom components are remotely selected, at step 50 an image  
20 manifest is created and stored on local storage. An image wizard accepts remotely  
inputted parameters from the customer for defining the image, such as hard disc drive  
partitions, power management, network setup, desktop setup, BIOS setup, and  
customer policies. The image manifest defines the image build components and the  
build process without requiring an image to be built and saved, thus reducing the  
25 storage space needed and allowing subsequent editing of the image manifest to define  
modifications to the image. At step 52, the image is built according to the image  
manifest by creating the image on a local hard disc drive according to the definitions  
set forth in the image manifest. At step 54, the built image is promoted to the factory  
for manufacture of information handling systems that have the built image copied to  
30 their hard disc drives. For instance, the built image is communicated by an FTP  
transfer to a factory server or, alternatively, copied to one or more optical media, such  
as CD or DVD optical media readable by manufactured information handling

systems. In the event that a customer desires a modification to the image, at step 56 the image manifest is edited to modify the image as desired, at step 50 the edited image manifest is stored and, at step 52 the modified image is created. Customers are thus provided with a considerable degree of flexibility in the remote management of customized images that can be modified as necessary to meet desired customer goals.

Although the present invention has been described in detail, it should be understood that various changes, substitutions and alterations can be made hereto without departing from the spirit and scope of the invention as defined by the appended claims.